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14MAT11

First Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Mathematics – I

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1 a. Find the n^{th} derivative of $\frac{x}{(x-1)(x^2+x-2)}$. (07 Marks)
- b. Find the angle of intersection of the curves, $r = a(1 + \cos\theta)$ and $r^2 = a^2 \cos 2\theta$. (06 Marks)
- c. Derive an expression for the radius of curvature in polar form. (07 Marks)

OR

- 2 a. If $\sin^{-1} y = 2 \log(x+1)$, prove that $(x+1)^2 y_{n+2} + (2n+1)(x+1)y_{n+1} + (n^2+4)y_n = 0$. (07 Marks)
- b. Find the pedal equation, $r^m = a^m (\cos m\theta + \sin m\theta)$. (06 Marks)
- c. If ρ be the radius of curvature at any point $P(x, y)$ on the parabola $y^2 = 4ax$ show that ρ^2 varies as $(SP)^3$ where S is the focus of the parabola. (07 Marks)

Module – 2

- 3 a. Obtain Taylor's series expansion of $\log(\cos x)$ about the point $x = \frac{\pi}{3}$ upto the fourth degree term. (07 Marks)
- b. If $u = f(r)$ where $r = \sqrt{x^2 + y^2 + z^2}$, show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = f''(r) + \frac{2}{r} f'(r)$. (06 Marks)
- c. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$. (07 Marks)

OR

- 4 a. Evaluate $\lim_{x \rightarrow 0} \left[\frac{1}{x^2} - \cot^2 x \right]$. (07 Marks)
- b. If u be a homogeneous function of degree n in x and y , prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu$. (06 Marks)
- c. If $u = x^2 + y^2 + z^2$, $v = xy + yz + zx$, $w = x + y + z$ find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. (07 Marks)

Module – 3

- 5 a. Find the unit tangent vector and unit normal vector to the curve $\vec{r} = \cos 2t \mathbf{i} + \sin 2t \mathbf{j} + t \mathbf{k}$ at $x = \frac{1}{\sqrt{2}}$. (07 Marks)
- b. Using differentiation under the integral sign, show that $\int_0^{\pi} \frac{\log(1 + a \cos x)}{\cos x} dx = \pi \sin^{-1} a$. (06 Marks)
- c. Use general rules to trace the curve $y^2(a-x) = x^3$, $a > 0$ (07 Marks)

OR

- 6 a. Show that $\vec{F} = \frac{x\vec{i} + y\vec{j}}{x^2 + y^2}$ is both solenoidal and irrotational. (07 Marks)
- b. Show that $\text{curl}(\phi \vec{A}) = \phi(\text{curl} \vec{A}) + \text{grad} \phi \times \vec{A}$. (06 Marks)
- c. Use general rules to trace the curve, $r = a \cos 2\theta$ (four leaved rose). (07 Marks)

Module – 4

- 7 a. Obtain the reduction formula for $\int \sin^m x \cos^n x dx$, where m and n are positive integers. (07 Marks)
- b. Solve $y(1 + xy + x^2y^2)dx + x(1 - xy + x^2y^2)dy = 0$. (06 Marks)
- c. Find the orthogonal trajectories of the family of curves $r = 4a \sec \theta \tan \theta$. (07 Marks)

OR

- 8 a. Evaluate (i) $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$ (ii) $\int_0^{2a} \frac{x^2}{\sqrt{2ax - x^2}} dx$. (07 Marks)
- b. Solve $\frac{dy}{dx} - y \tan x = \frac{\sin x \cos^2 x}{y^2}$ (06 Marks)
- c. The R-L series circuit differential equation acted on by an electromotive force $E \sin \omega t$ satisfies the differential equation, $L \frac{di}{dt} + Ri = E \sin \omega t$. If there is no current in the circuit initially, obtain the value of current at any time 't'. (07 Marks)

Module – 5

- 9 a. Solve $2x + y + 4z = 12$, $4x + 11y - z = 33$, $8x - 3y + 2z = 20$ by Gauss elimination method. (07 Marks)
- b. Diagonalize the matrix, $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$. (06 Marks)
- c. Determine the largest eigen value and the corresponding eigen vector of $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ using Rayleigh's power method. (07 Marks)

OR

- 10 a. Solve by LU decomposition method, $4x_1 + x_2 + x_3 = 4$, $x_1 + 4x_2 - 2x_3 = 4$, $3x_1 + 2x_2 - 4x_3 = 6$. (07 Marks)
- b. Show that the transformation, $y_1 = 2x_1 - 2x_2 - x_3$, $y_2 = -4x_1 + 5x_2 + 3x_3$, $y_3 = x_1 - x_2 - x_3$ is regular and find the inverse transformation. (06 Marks)
- c. Reduce the quadratic form, $x_1^2 + 5x_2^2 + x_3^2 + 2x_1x_2 + 6x_1x_3 + 2x_2x_3$ into canonical form by orthogonal transformation. Indicate the orthogonal transformation. (07 Marks)

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14CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting
ONE full question from each module.**

Module-1

- 1 a. Define ion selective electrode. Explain the principle and construction of glass electrode. (05 Marks)
- b. Describe the construction and working of Ni-metal hydride battery. Write its application. (05 Marks)
- c. Define concentration cell. The spontaneous cell $\text{Sn}|\text{Sn}^{2+} (0.024 \text{ M})||\text{Sn}^{2+} (0.064)|\text{Sn}$ at 25°C . Calculate the emf of the cell and cell reactions. (05 Marks)
- d. Explain the following battery characteristics: (05 Marks)
 - i) Voltage,
 - ii) Energy efficiency,
 - iii) Cycle life
- 2 a. Derive Nernst's equation for single electrode potential. (05 Marks)
- b. Define fuel cell. Explain the construction and working of Lithium MnO_2 cell. Write its application. (05 Marks)
- c. What are secondary reference electrodes? Explain the construction and working of Calomel Electrode. (05 Marks)
- d. Explain the construction and working of Methanol Oxygen fuel cell. (05 Marks)

Module-2

- 3 a. Explain the following corrosion types: (05 Marks)
 - i) Differential metal corrosion,
 - ii) Differential aeration corrosion.
- b. Define electroplating. Write technological importance of metal finishing. (05 Marks)
- c. What is anodic metal coating? Explain the process of Galvanizing. (05 Marks)
- d. Describe the electroplating of chromium. (05 Marks)
- 4 a. Explain the electrochemical theory of rusting of iron. (05 Marks)
- b. Discuss the electroless plating of copper with reactions. (05 Marks)
- c. Explain the factors affecting the rate of corrosion: (05 Marks)
 - i) Nature of corrosion product
 - ii) pH
- d. Discuss the following principles of metal finishing: (05 Marks)
 - i) Decomposition potential
 - ii) Over voltage.

Module-3

- 5 a. Define calorific value of a fuel. Explain the calorific value of solid fuel by determination by bomb calorimeter. (05 Marks)
- b. Define photovoltaic cell. Explain construction and working of PV cell. (05 Marks)
- c. Explain the synthesis of petrol by Fischer-Tropsch process. (05 Marks)
- d. Explain the purification of Silicon by zone refining process. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Define cracking. Explain the process of fluidized bed catalytic process cracking with neat diagram. (05 Marks)
- b. Discuss the production of solar grade Silicon by Union Carbide process. (05 Marks)
- c. Write a short note on power alcohol and knocking in petrol engine. (05 Marks)
- d. Define doping. Write two physical and two chemical properties of silicon. (05 Marks)

Module-4

- 7 a. Define polymer. Explain the addition and condensations polymerization with examples. (05 Marks)
- b. Discuss the synthesis and application of Silicon rubber and polyurethane. (05 Marks)
- c. Explain any two structures and property of relations of polymers. (05 Marks)
- d. Write the mechanism of conduction in polyaniline. (05 Marks)
- 8 a. Explain free radical mechanism of addition polymerization by taking Vinyl Chloride as an example. (05 Marks)
- b. Explain the synthesis and applications of (i) plexi-glass, (ii) Teflon. (05 Marks)
- c. Discuss the factors influencing the T_g :
- i) Flexibility (05 Marks)
- ii) Branching and cross linking. (05 Marks)
- d. What are conducting polymers? Write synthesis properties of Carbon fibres. (05 Marks)

Module-5

- 9 a. How scales and sludges are formed in boilers and write its disadvantages. (05 Marks)
- b. What are nanoscale materials? Explain synthesis of nanomaterials by chemical vapour condensation method. (05 Marks)
- c. What is desalination of water? Explain the desalination of sea water by reverse osmosis. (05 Marks)
- d. Write a note on size dependent properties of nanomaterials. (05 Marks)
- 10 a. Write a note on secondary sewage treatment method. (05 Marks)
- b. Write an account on carbon nanotubes. (05 Marks)
- c. Define fullerenes. Explain hydrothermal synthesis of nanomaterials. (05 Marks)
- d. 25 cm^3 of an effluent sample requires for oxidation of 8 cm^3 of $0.001\text{M K}_2\text{Cr}_2\text{O}_7$. Calculate the COD of the effluent sample. (05 Marks)

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First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Physics

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing one full question from each module.

2. Physical constants : Velocity of light $C = 3 \times 10^8$ m/s ;

Planck's constant $h = 6.625 \times 10^{-34}$ JS ; Mass of electron $e = 9.11 \times 10^{-31}$ kg ;

Boltzmann constant $K = 1.38 \times 10^{-23}$ JK ; Avagadro number $N_A = 6.02 \times 10^{26}$ /k mole.

Module-1

- 1
 - a. Show that how Plank's law can be reduced to Wein's law and Rayleigh – Jeans law. (06 Marks)
 - b. What is a Wave function? List the properties of wave function. (06 Marks)
 - c. Show that group velocity is equal to particle velocity. (04 Marks)
 - d. A Quantum particle is confined to one dimensional box of width 'a' is its first excited state. What is the probability of finding the particle over an interval of $a/2$ marked symmetrically at the centre of the box. (04 Marks)
- 2
 - a. Explain Black body radiation spectrum. (04 Marks)
 - b. Obtain the energy eigen value expression and energy eigen functions for an electron in one dimensional potential well of infinite height. (08 Marks)
 - c. What are the characteristics of matter waves? (04 Marks)
 - d. The velocity of an electron of a hydrogen atom in the ground state is 2.19×10^6 m/s. Calculate the wavelength of the de Broglie waves associated with its motion. (04 Marks)

Module-2

- 3
 - a. Define the terms drift velocity, thermal velocity, mean collision time and mean free path. (04 Marks)
 - b. What is Hall effect? Obtain an expression for Hall coefficient. (06 Marks)
 - c. Explain the temperature dependence of electrical resistivity in metals and super conductors. (06 Marks)
 - d. The Hall coefficient of a specimen of doped silicon found to be 3.66×10^{-4} m³/Coulomb. The resistivity of a specimen is 9.33×10^{-3} ohm – m. Find the mobility and density of the charge carrier, assuming single carrier concentration. (04 Marks)
- 4
 - a. Explain the success of Quantum free electron theory. (06 Marks)
 - b. What are intrinsic and extrinsic semiconductors? Obtain an expression for fermi level in intrinsic semiconductors. (06 Marks)
 - c. Explain in brief construction and working of maglev vehicles. (04 Marks)
 - d. An intrinsic semiconductors has an energy gap of 0.4ev. Calculate the probability of occupation of the lowest energy level in conduction band at 100°C. (04 Marks)

Module-3

- 5
 - a. Obtain an expression for energy density of emitted radiation under equilibrium condition. (06 Marks)
 - b. Obtain an expression for numerical aperture in an optical fiber. (05 Marks)
 - c. Explain the construction and working of semiconductor laser. (05 Marks)
 - d. The angle of acceptance of an optical fiber is 30, when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. (04 Marks)

- 6 a. What is Holography? Explain the recording and reconstruction processes in holography, with the help of suitable diagrams. (06 Marks)
- b. Describe the application of optical fibers in point to point communication with suitable block diagram. (05 Marks)
- c. Explain different types of optical fibers. (05 Marks)
- d. The average output power of Laser Source emitting a laser beam of wavelength 6328 \AA is 5mw. Find the number of Photons emitted per second by the laser source. (04 Marks)

Module-4

- 7 a. Explain in brief Seven Crystal Systems, with neat diagram. (07 Marks)
- b. Define Lattice, basis, crystal structure and unit cell. (04 Marks)
- c. Explain the procedure to find Miller indices of crystal plane. (04 Marks)
- d. The first order Bragg's reflection occurs at angle 20° in the plane (111). Find the wavelength of X – rays if lattice constant is 3.615 \AA . (05 Marks)
- 8 a. Derive Bragg's law for crystal structure. (05 Marks)
- b. Explain the structure of Perovskite crystal structure, with neat diagram. (07 Marks)
- c. List the differences between LED and LCD devices. (04 Marks)
- d. Draw the following planes in a cubic unit cell (100), (110), (111) and (112). (04 Marks)

Module-5

- 9 a. Explain the description and working of Reddy's shock tube. (08 Marks)
- b. Describe the various Quantum structures. (04 Marks)
- c. List the characteristics of Reddy's Shock tube. (04 Marks)
- d. Describe the preparation of nanoparticles by ball milling method. (04 Marks)
- 10 a. Describe Acoustic, Ultrasonic, Subsonic and Supersonic waves. (04 Marks)
- b. Explain the structure of different Carbon nanotubes, with neat diagram. (08 Marks)
- c. Describe the principle and working of SEM, with neat diagram. (08 Marks)

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14PCD13/23

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Programming in 'C' and Data Structures

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting ONE full question from each module.

Module-1

- 1 a. List all the restrictions on the variable names. (06 Marks)
b. Explain the block structure of a 'C' program. (08 Marks)
c. What are the basic data types available in 'C'? Write the significance of each data type. (06 Marks)
- 2 a. What is an assignment statement? Give the general form of an assignment statement. (05 Marks)
b. Explain with example, the various constants available in 'C' program. (05 Marks)
c. List and explain any five operators used in 'C' programming language. (10 Marks)

Module-2

- 3 a. Explain with example, the meaning of statement and block in a 'C' program. (05 Marks)
b. Explain with a syntax, the different loops used in 'C' program. (09 Marks)
c. Write a program in 'C' to find the sum of 'n' natural number without using any loops. (06 Marks)
- 4 a. Explain with example, the need of 'break' statement in a 'C' program. (05 Marks)
b. Write a 'C' program to demonstrate the use of unconditional goto statement. (06 Marks)
c. Explain with syntax, if, if-else and nested if-else statements in 'C' program. (09 Marks)

Module-3

- 5 a. What is the purpose of an array? Explain how two dimensional arrays is declared and initialized. (06 Marks)
b. Explain with example :
i) Character string
ii) String literal. (06 Marks)
c. Write a program in 'C' using functions to swap two numbers. (08 Marks)
- 6 a. Explain with syntax and example, the different types of string manipulation functions. (10 Marks)
b. Explain with example, the general form of puts and gets function. (04 Marks)
c. What are the three possibilities of defining a user defined functions in 'C'? (06 Marks)

Module-4

- 7 a. What is a structure data type? Give the general form of a structure declaration. (05 Marks)
b. Explain the syntax of fprintf and fscanf functions in 'C'. (05 Marks)
c. Using the structure data type, write a program in 'C' to read a student record from the keyboard and store it in a file called student.dot. (10 Marks)

- 8 a. Explain the differences between arrays and structures. (05 Marks)
b. What is a file? Explain fopen() and fclose() functions in 'C' language. (06 Marks)
c. Write a program in 'C' using structure to read USN, name and marks in 3 subjects for each student and store it in a file called studmarks.dat. (09 Marks)

Module-5

- 9 a. Write a 'C' program to define macros for logical operators. (08 Marks)
b. Explain the following :
i) preprocessor directive
ii) malloc() function
iii) # include directive. (06 Marks)
c. Explain the need of dynamic memory allocation. (06 Marks)
- 10 a. Explain with example # define directive. (04 Marks)
b. What is a stack? What are the operations we can carry out on a stack? (08 Marks)
c. Write a program in 'C' to create a simple linked list. (08 Marks)

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1 a. With a neat sketch, explain the components of i) Earth dam; ii) Gravity dam. (10 Marks)
 b. Determine the X and Y components of the forces shown in Fig.Q.1(b). (10 Marks)

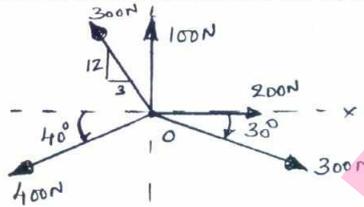


Fig.Q.1(b)

- 2 a. Define couple and state its characteristics. (06 Marks)
 b. Draw a neat sketch of RCC-T beam bridge and name its components. (04 Marks)
 c. Replace the system of forces acting on the frame shown in Fig.Q.2(c), by a resultant force 'R' through 'A' and a couple acting horizontally through 'B' and 'C'. (10 Marks)

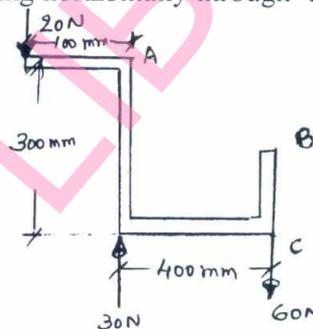


Fig.Q.2(c)

Module – 2

- 3 a. State and prove parallelogram law of forces. (06 Marks)
 b. Check the stability of the dam carrying the forces as shown in Fig.Q.3(b). The dam is said to be stable if the resultant lies in the middle 1/3 of the base OT. (10 Marks)

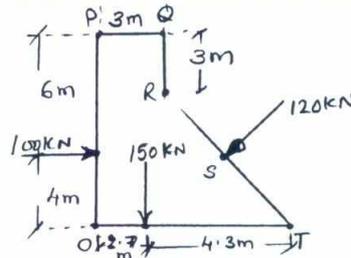


Fig.Q.3(b)

- c. Define resultant and equilibrant of a force system. (04 Marks)

- 4 a. State and prove Varignon's theorem. (06 Marks)
- b. Two locomotives on opposite banks of a canal pull a vessel moving parallel to the banks of a canal by means of ropes as shown in Fig.Q.4(b). The tension in the ropes are 20kN and 24kN while the angle between them is 60° . Find the resultant pull on the vessel along the centerline and the angle ' α ' and ' β '. (08 Marks)

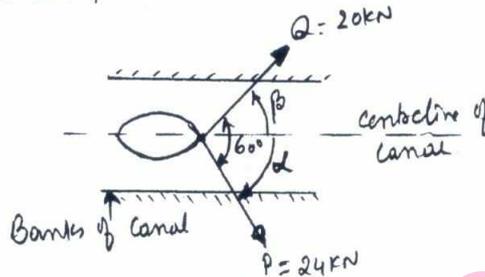


Fig.Q.4(b)

- c. An electric transmission tower supports two cables carrying tensions of 80kN and 120kN as shown in Fig.Q.4(c). Determine the required tension in the guy wire AB, so that the resultant of the forces exerted by three cables will be vertical. Also find the magnitude of the resultant. (06 Marks)

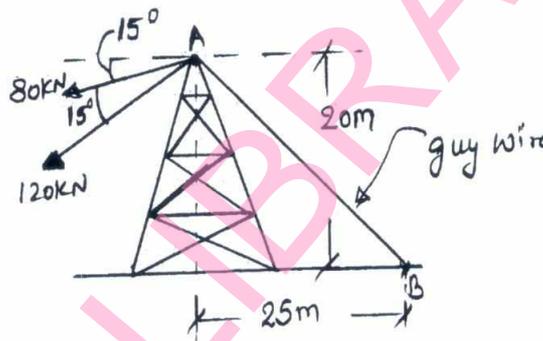


Fig.Q.4(c)

Module – 3

- 5 a. State conditions of equilibrium for coplanar concurrent and non concurrent force system. (04 Marks)
- b. Draw a neat sketch showing the number of reactions at i) Roller support; ii) Hinged support; iii) Fixed support. (06 Marks)
- c. Find the least value of 'P' required to cause the system of block shown in Fig.Q.5(c) to have impending motion to the left. The coefficient of friction for all contact surfaces are 0.2. (10 Marks)

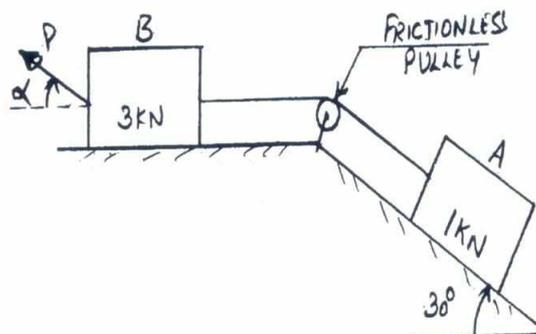


Fig.Q.5(c)

- 6 a. Define the terms: i) Coefficient of friction; ii) Angle of repose. (06 Marks)
 b. Find the reactions for the beam loaded as shown in Fig.Q.6(b). (06 Marks)

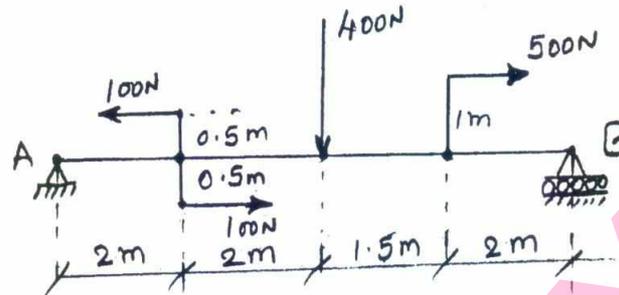


Fig.Q.6(b)

- c. Cylinder 'A' of diameter 200mm and cylinder 'B' of diameter 300mm are placed in a trough shown in Fig.6(c). If cylinder 'A' weighs 800N and cylinder 'B' weighs 1200N, determine the reactions developed at contact surfaces P, Q, R and S. Assume that all contact surfaces are smooth. (08 Marks)

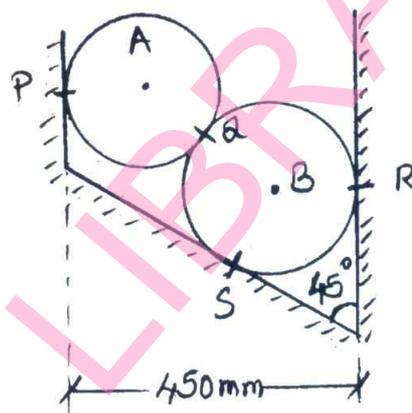
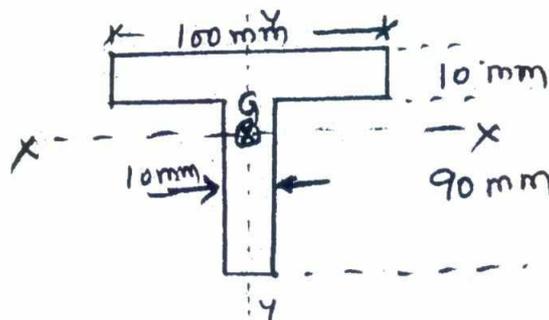


Fig.Q.6(c)

Module - 4

- 7 a. Derive an expression for the centroid of a semicircle of radius 'r' with respect to the base of the semicircle from the first principles. (06 Marks)
 b. Determine the radius of gyration for the area shown in Fig.Q.7(b), along horizontal XX and vertical YY axis passing through the centroid of the area. (14 Marks)



- 8 a. State and prove parallel axis theorem. (06 Marks)
 b. Locate the centroid of the lamina shown in Fig.Q.8(b) with respect to point 'O'. (14 Marks)

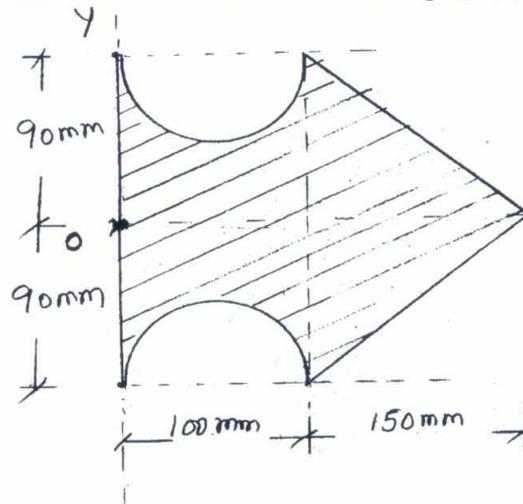


Fig.Q.8(b)

Module - 5

- 9 a. State Newton's Law's of motion. (06 Marks)
 b. What is super elevation and list the benefits of providing the super elevation. (06 Marks)
 c. A projectile is fired at certain angle with the horizontal and has a horizontal range of 3.5km. If the maximum height reached is 500m, what is the angle of elevation of the cannon? What was the muzzle velocity of the projectile? (08 Marks)
- 10 a. A small steel ball is shot up vertically with a velocity of 19.6 m/sec, from the top of a building 24.5m high. Calculate:
 i) Time required for the ball to reach maximum height.
 ii) How high the ball will rise above the building?
 iii) Compute the velocity with which it will strike the ground.
 iv) Total time for which the ball is in motion. (10 Marks)
- b. The distance between two stations is 2500m. The locomotive starts from first station with an acceleration such that it reaches a speed of 36 kmph in 30 secs until its speed attained is 55 kmph. This speed is maintained until the brakes are applied and the locomotive is brought to rest at second station with a retardation of 1m/sec^2 . Find the time taken to perform the journey and the distance covered during the acceleration, uniform and retarded motion. (10 Marks)

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14EME14/24

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
ONE full question from each module.**

Module – 1

- 1 a. Briefly explain petroleum based liquid fuels and gaseous fuels. (04 Marks)
- b. With the help of suitable sketch explain the working of typical wind mill. (06 Marks)
- c. Explain the working of Babcock and Wilcox boiler with neat diagram. (10 Marks)
- 2 a. Define solar constant. With neat sketch, explain the working of flat plate collector. (06 Marks)
- b. Compare bio fuels with petroleum fuels in terms of Calorific value and emission. (06 Marks)
- c. With respect to steam, define the following terms and mention the units :
 - i) Enthalpy of wet steam
 - ii) Degree of superheat
 - iii) Internal energy and
 - iv) Specific volume. (08 Marks)

Module – 2

- 3 a. Briefly explain Delaval steam turbine with the help of pressure and velocity diagrams. (06 Marks)
- b. Differentiate between open cycle and closed cycle gas turbines. (06 Marks)
- c. With the help of line diagram explain the working of 4-stroke petrol engine. (08 Marks)
- 4 a. Differentiate between impulse turbine and Reaction turbine. (06 Marks)
- b. With suitable sketch explain the working of Pelton wheel impulse turbine. (06 Marks)
- c. Following observations are taken during a trial on 4-stroke petrol engine :

* Cylinder diameter = 25cm	* Stroke length = 40cm
* Crank shaft speed = 250rpm	* Brake load = 70kg
* Brake drum dia = 2m	* MEP = 6 bar
* Diesel oil consumption = 0.1 m ³ /min	* Calorific value = 43900kJ/kg
* Specific gravity of diesel = 0.78	

 Find :
 - i) Brake power
 - ii) Indicated power
 - iii) Mechanical efficiency
 - iv) Frictional power
 - v) Brake Thermal efficiency
 - vi) Indicated Thermal efficiency. (08 Marks)

Module – 3

- 5 a. With suitable sketches, differentiate between the following machining operations :
 - i) Drilling and Tapping
 - ii) Counter boring and counter sinking. (08 Marks)
- b. What is Robot? Mention its applications in industries. (06 Marks)
- c. With the help of block diagram, explain the basic elements of CNC system. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. With suitable sketches explain the following machining operations:
i) Taper turning by swiveling compound rest method
ii) Slot milling. (08 Marks)
- b. Briefly explain the following configuration of Robot :
i) Cartesian Co-ordinate configuration
ii) Cylindrical Co-ordinate configuration (06 Marks)
- c. With the help of block diagram, explain the basic elements of NC system. (06 Marks)

Module – 4

- 7 a. Explain the following non-ferrous metals in terms of properties and uses :
i) Copper
ii) Aluminium. (08 Marks)
- b. Explain briefly how composite materials are classified. (06 Marks)
- c. With suitable sketch explain the principle and operation of arc welding process. (06 Marks)
- 8 a. Bring out the broad classification of Ferrous metals and discuss in brief. (08 Marks)
- b. What are the advantages and disadvantages of composite materials over other materials? (06 Marks)
- c. Briefly discuss the three types of flames used in gas welding. (06 Marks)

Module – 5

- 9 a. Define the following terms :
i) Refrigeration effect
ii) Ton of Refrigeration
iii) Co-efficient of Performance (COP) (06 Marks)
- b. With suitable sketch explain the working of vapour compression refrigeration system. (08 Marks)
- c. List the various applications of Air conditioner. (06 Marks)
- 10 a. What are the desirable properties of refrigerant? Explain in brief. (06 Marks)
- b. With suitable sketch, explain the working of vapour absorption refrigeration system. (08 Marks)
- c. Explain the working of Room Air conditioner with suitable sketch. (06 Marks)

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CBCS Scheme

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14ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017

Basic Electrical Engineering

Time: 3 hrs.

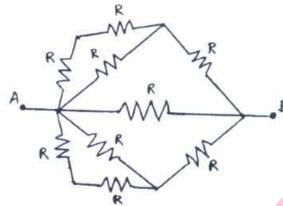
Max. Marks: 100

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Calculate effective resistance between points A and B for the combination of resistances given in fig.Q1(a). (05 Marks)

Fig.Q1(a)



- b. Bring out clearly analogy between Magnetic and Electric circuits. (06 Marks)
 c. State and explain : i) Faraday's laws ii) Fleming's left hand rule iii) Fleming's right hand rule. (09 Marks)

OR

- 2 a. The domestic power in a house comprises of loads as given in table. Calculate i) The total load and current taken from the supply of 230V ii) Total energy consumption per month 1HP = 746W. (08 Marks)

Sl. No.	Item	Load	Hours used/day
1	8 Lamps	100 W	10
2	3 fans	80 W	8
3	1 Refrigerator	½ HP	24
4	1 Heater	1000 W	1

- b. An air cored Solenoid consists of 1500 turns of wire wound on a length of 60cm. A search coil of 500 turns, enclosing a mean area of 20cm² is placed centrally in the solenoid. Find i) the mutual inductance of the arrangement ii) the emf induced in the search coil, when the current in the solenoid is changing uniformly at the rate of 250A/sec. (06 Marks)
 c. Derive an expression for dynamically induced e.m.f. (06 Marks)

Module-2

- 3 a. With neat sketch, explain the constructional features of a D.C machine. (08 Marks)
 b. Explain with neat sketch, the construction, working and theory of operation of Dynamometer type Wattmeter. (08 Marks)
 c. A four pole D.C. motor has its armature lap wound with 1040 conductors and runs at 1000 rpm, when taking an armature current of 50A from a 250V D.C supply. The resistance of the armature is 0.2Ω. Calculate the useful flux per pole of the motor. (04 Marks)

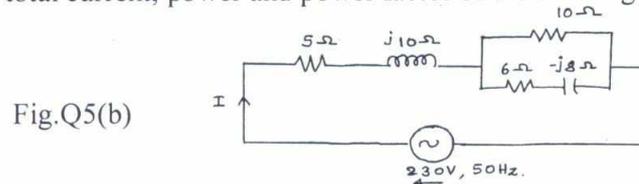
OR

- 4 a. Explain types of D.C. motors and characteristics of D.C. shunt motor. (08 Marks)
 b. Derive the e.m.f. equation of a D.C. generator. (06 Marks)
 c. List out applications of D.C. motor and explain why starter is required for a D.C. motor. (06 Marks)

Module-3

- 5 a. Define i) Real power ii) Reactive power iii) Apparent power iv) Power factor v) Form factor. (05 Marks)

- b. Find the total current, power and power factor of the circuit given in fig. Q5(b). (07 Marks)



- c. Write a note on : i) Two way control of lamp ii) M.C.B. (08 Marks)

OR

- 6 a. With a neat diagram, explain service mains, meter board and distribution board of a domestic wiring system. (08 Marks)
 b. Derive an equation for the power consumed by an R-C series circuit. Draw the waveforms of voltage, current and power. (08 Marks)
 c. An alternating current i is given by $i = 141.4 \sin 314t$. Find i) The maximum value ii) Frequency iii) Time period and iv) the instantaneous value when t is 3m.s. (04 Marks)

Module-4

- 7 a. Show that two Wattmeters are sufficient to measure three phase power and also derive expression for power factor. (08 Marks)
 b. Write the differences between salient pole type and non salient pole type rotor of a synchronous generator. (04 Marks)
 c. Each phase of a delta connected load comprises a resistor of 50Ω and capacitor of $50 \mu\text{f}$ in series. Calculate i) line and phase currents ii) total power when load is connected to a 440V, 3 phase, 50Hz supply. (08 Marks)

OR

- 8 a. A 4 pole, 3 phase, 50Hz star connected alternator has an induced line voltage of 3300V. Determine the flux per pole assuming $K_p = 1$ and $K_d = 0.96$. The armature has 9 slots per pole and 8 conductors per slot. (06 Marks)
 b. The input power to a 1.6KV, 50Hz, 3 phase motor is measured by using two wattmeter method. The motor is running on full load with an efficiency of 86%. The readings of the two wattmeters are 255KW and 85KW. Determine i) The input power ii) The power factor iii) The line current and iv) The output power. (08 Marks)
 c. Derive the emf. equation of an alternator. (06 Marks)

Module-5

- 9 a. Define Efficiency and voltage regulation of a transformer and give their equations. (06 Marks)
 b. Explain the working of Star – Delta starter, with neat sketch for a 3 phase induction motor. (06 Marks)
 c. A single phase 25 KVA, 1000/2000V, 50Hz transformer has a maximum efficiency of 98% at full load u.p.f. Determine its efficiency at i) $3/4^{\text{th}}$ full load u.p.f ii) $1/2$ full load 0.8 p.f iii) 1.25 full load 0.9 p.f. (08 Marks)

OR

- 10 a. Prove that the stator magnetic field has a constant magnitude and rotates at synchronous speed in an induction motor. (08 Marks)
 b. Derive the e.m.f equation of a transformer. (06 Marks)
 c. A 3 phase induction motor is wound for 4 pole and is supplied from 50Hz system. Calculate i) Synchronous speed ii) The speed of the motor when slip is 4% iii) The rotor current frequency when motor runs at 1440 rpm. (06 Marks)

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CBCS Scheme

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14ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017

Basic Electrical Engineering

Time: 3 hrs.

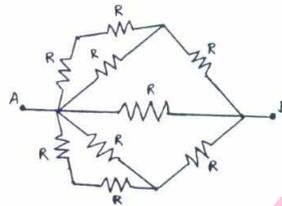
Max. Marks: 100

Note: Answer FIVE full questions, choosing one full question from each module.

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Fig.Q1(a)



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- 3 a. With neat sketch, explain the constructional features of a D.C machine. (08 Marks)
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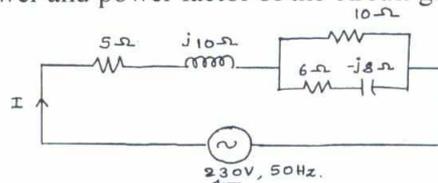
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- 5 a. Define i) Real power ii) Reactive power iii) Apparent power iv) Power factor v) Form factor. (05 Marks)

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Fig.Q5(b)



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- b. Derive an equation for the power consumed by an R-C series circuit. Draw the waveforms of voltage, current and power. (08 Marks)
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Module-4

- 7 a. Show that two Wattmeters are sufficient to measure three phase power and also derive expression for power factor. (08 Marks)
- b. Write the differences between salient pole type and non salient pole type rotor of a synchronous generator. (04 Marks)
- c. Each phase of a delta connected load comprises a resistor of 50Ω and capacitor of $50 \mu\text{f}$ in series. Calculate i) line and phase currents ii) total power when load is connected to a 440V, 3 phase, 50Hz supply. (08 Marks)

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- b. The input power to a 1.6KV, 50Hz, 3 phase motor is measured by using two wattmeter method. The motor is running on full load with an efficiency of 86%. The readings of the two wattmeters are 255KW and 85KW. Determine i) The input power ii) The power factor iii) The line current and iv) The output power. (08 Marks)
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- 9 a. Define Efficiency and voltage regulation of a transformer and give their equations. (06 Marks)
- b. Explain the working of Star – Delta starter, with neat sketch for a 3 phase induction motor. (06 Marks)
- c. A single phase 25 KVA, 1000/2000V, 50Hz transformer has a maximum efficiency of 98% at full load u.p.f. Determine its efficiency at i) $3/4^{\text{th}}$ full load u.p.f ii) $1/2$ full load 0.8 p.f iii) 1.25 full load 0.9 p.f. (08 Marks)

OR

- 10 a. Prove that the stator magnetic field has a constant magnitude and rotates at synchronous speed in an induction motor. (08 Marks)
- b. Derive the e.m.f equation of a transformer. (06 Marks)
- c. A 3 phase induction motor is wound for 4 pole and is supplied from 50Hz system. Calculate i) Synchronous speed ii) The speed of the motor when slip is 4% iii) The rotor current frequency when motor runs at 1440 rpm. (06 Marks)

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First/Second Semester B.E Degree Examination, Dec.2016/Jan.2017
Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. Increasing Industrialisation is causing much danger to man's life by
 - a) Polluting the environment
 - b) Producing more goods
 - c) Providing more jobs
 - d) Utilizing waste land
2. The most environmentally friendly method of insect control from the following is
 - a) Application of organophosphates
 - b) Application of chlorinated hydro carbons
 - c) Application of pyrethroids
 - d) Crop rotation and Intercropping.
3. What does the abbreviation 'GIS' stands for
 - a) Geographical Information system
 - b) Geological Information system
 - c) Geographical Interpretation system
 - d) Geoscience Information system
4. Which of the following is likely to be present in photochemical smog?
 - a) Ozone
 - b) Peroxyacetyl nitrates (PAN)
 - c) Aldehyde
 - d) All of these
5. Which of the following components of the environment encompass living things?
 - a) Atmosphere
 - b) Hydrosphere
 - c) Lithosphere
 - d) Biosphere
6. Ozone depletion will cause
 - a) More ultraviolet radiation from the sun to reach the earth
 - b) Increased in skin cancer and
 - c) Weakening of human immune system
 - d) All of these
7. Noise is,
 - a) Loud sound
 - b) Unwanted sound
 - c) Constant sound
 - d) Sound of high frequency
8. Which of the following is not a marine pollutant?
 - a) Oil
 - b) Plastics
 - c) Dissolved oxygen
 - d) Sewage

37. Non point sources of pollution includes all of the following except _____
- Wind carrying dirt and pesticides from crop lands
 - A smoke stack from power plant
 - Run off from stockyards
 - Fertilizer runoff from agricultural fields.
38. Which one of the following human organ is damaged by fluoride pollution in water
- Teeth
 - Kidney
 - Brain
 - Lungs
39. Self assimilation of nutrient from 'photons' the light packets is termed as
- Heterotrophy
 - Photo autotrophy
 - Autotrophy
 - Chemotrophy
40. The IS code for potable water is
- IS : 10500
 - IS : 10000
 - IS : 20000
 - IS : 2014
41. Succession of life forms that starts in water is called
- Hydrobionts
 - Hydrophytes
 - Phytoplanktons
 - Hydrosere
42. 'Silicosis' is prevalent in the
- Textile industry
 - Sugar industry
 - Stone crushers
 - Storage battery industries
43. The minimum DO level needed for existence of life forms in water
- 1 mg/L
 - 2 mg/L
 - 3 mg/L
 - 4 mg/L
44. The water vapour to Ozone ratio in the healthy troposphere is
- 1000 : 1
 - 1 : 1
 - 100 : 1
 - 1 : 1000
45. What is the minimum nutritional requirement of the secured foods?
- 1500 cal
 - 2000 cal
 - 200 cal
 - 500 cal
46. Which of the following remote sensing technologies uses sound?
- Radar
 - Sonar
 - thermal infrared imaging
 - colour infrared imaging
47. The mile stone marking the birth of the environmental movement was
- The Publication of the book silent spring by Rachel Carson in 1962
 - Chernobyl disaster
 - Founding of green peace
 - 1st World war
48. The process of conversion of atmospheric nitrogen to available nitrate form is called
- Nitrogen synthesis
 - Denitrification
 - Nitrification
 - Nitrifxing.
49. Which of the following is not a key concept that is part of our definition of GIS.
- GIS can be used in all areas of modern science
 - GIS technologies include GPS and remote sensing
 - GIS includes both computer hardware and software
 - People are an important part of GIS.
50. The Mars orbiter Mission (MOM), informally called Mangalayaan is India's first Mars orbiter and was launched by the vehicle.
- ASLV (Augmented Satellite Launch Vehicle)
 - PSLV (Polar Satellite Launch Vehicle)
 - GSLV (Geo synchronous Launch Vehicle).
 - Ariane - 5.

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14MAT21

Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Mathematics – II

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1 a. Solve $\frac{d^4y}{dx^4} + 5\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} - 4\frac{dy}{dx} - 8y = 0$. (06 Marks)
- b. Solve $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{-x} + \sin 2x$. (07 Marks)
- c. Solve by the method of undetermined coefficient, $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$. (07 Marks)
- 2 a. Solve $4\frac{d^4y}{dx^4} - 8\frac{d^3y}{dx^3} - 7\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ (06 Marks)
- b. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 1 + 3x + x^2$. (07 Marks)
- c. Solve by the method of variation of parameter $y'' + a^2y = \sec ax$. (07 Marks)

Module – 2

- 3 a. Solve $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 13y = \log x + x^2$. (06 Marks)
- b. Solve $x^2p^2 + 3xyp + 2y^2 = 0$. (07 Marks)
- c. Find the general and singular solution of, $(x^2 - 1)p^2 - 2xyp + y^2 - 1 = 0$. (07 Marks)
- 4 a. Solve the system of equations,
 $\frac{dx}{dt} = 3x - 4y, \frac{dy}{dt} = x - y$. (06 Marks)
- b. Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin \log(1+x)$. (07 Marks)
- c. Solve $y = 2px - yp^2$ (07 Marks)

Module – 3

- 5 a. Form a partial differential equation by eliminating arbitrary function,
 $f(x + y + z, x^2 + y^2 + z^2) = 0$ (06 Marks)
- b. Derive one dimensional wave equation. (07 Marks)
- c. Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y dx dy$. (07 Marks)
- 6 a. Form a P.D.E by eliminating arbitrary constants,
 $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ (06 Marks)
- b. Evaluate $\int_0^4 \int_0^{\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dy dx dz$. (07 Marks)

- c. Solve one dimensional heat equation by separation of variables. Given $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. (07 Marks)

Module - 4

- 7 a. For $m > 0, n > 0$ show that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (06 Marks)

b. Prove that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \cdot \int_0^1 \frac{1}{\sqrt{1+x^4}} dx = \frac{\pi}{4\sqrt{2}}$. (07 Marks)

- c. Prove that cylindrical co-ordinate system is orthogonal. (07 Marks)

- 8 a. Find the volume of the sphere, $x^2 + y^2 + z^2 = a^2$ using triple integral. (06 Marks)

- b. For m and n positive prove that,

$$\beta(m, n) = \int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx. \quad (07 \text{ Marks})$$

- c. Express the vector $\vec{f} = 2y\hat{i} - z\hat{j} + 3x\hat{k}$ in cylindrical co-ordinates. (07 Marks)

Module - 5

- 9 a. Find the Laplace transform of, (i) $e^{3t}t^4$ (ii) $\sin t \sin 2t \sin 3t$ (06 Marks)

- b. A periodic function of period $\frac{2\pi}{W}$ is defined by,

$$f(t) = \begin{cases} E \sin \omega t & \text{for } 0 \leq t \leq \frac{\pi}{W} \\ 0 & \text{for } \frac{\pi}{W} \leq t \leq \frac{2\pi}{W} \end{cases} \quad \text{where } E \text{ and } W \text{ are positive constants. Show that}$$

$$L\{f(t)\} = \frac{EW}{(s^2 + w^2) \left(1 - e^{-\frac{\pi s}{W}}\right)}. \quad (07 \text{ Marks})$$

- c. Find the inverse Laplace transform, $\frac{1}{s(s+1)(s+2)}$. (07 Marks)

- 10 a. Find $L\left(\frac{\cos 2t - \cos 3t}{t}\right)$. (06 Marks)

b. Express $f(t) = \begin{cases} t^2 & 1 < t \leq 2 \\ 4t & t > 2 \end{cases}$

in terms of unit step function and hence find $L[f(t)]$. (07 Marks)

- c. Solve using Laplace transform method, $y'' + 2y' - 3y = \sin t$, $y(0) = y'(0) = 0$ (07 Marks)
